

WHAT IS CLAIMED IS

1. An optical fiber with Numerical Aperture (NA) compression comprising:

a tapered fiber section of a predetermined length having a light input end of a first predetermined diameter and having a light output end of a second predetermined diameter greater than said first predetermined diameter.

2. The combination according to Claim 1 wherein said tapered fiber section has a uniform taper from the light input end thereof to the light output end thereof.

3. The combination according to Claim 2 wherein said tapered fiber section has a generally conical shape.

4. The combination according to Claim 1 wherein said tapered fiber section has a generally conical shape.

1 5. An optical fiber with Numerical Aperture (NA) compression
2 including in combination:

3 a first fiber section having a light input end and a
4 light output end and having a first predetermined diameter; and

5 a tapered fiber section of a predetermined length having
6 an input end of said first predetermined diameter optically coupled
7 with the output end of said first fiber section and having an
8 output end of a second predetermined diameter greater than said
9 first predetermined diameter.

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11 6. The combination according to Claim 5 wherein said tapered
12 fiber section has a uniform taper from the light input end thereof
13 to the light output end thereof.

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15 7. The combination according to Claim 6 wherein said tapered
16 fiber section has a generally conical shape.

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18 8. The combination according to Claim 7 wherein said first
19 end of said tapered fiber section is physically coupled with the
20 output end of said first fiber section.

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22 9. The combination according to Claim 8 wherein said tapered
23 fiber section is integrally formed with said first fiber section on
24 the output end thereof.

1 10. The combination according to Claim 9 wherein said first
2 fiber section and said tapered fiber section comprise glass fibers.

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4 11. The combination according to Claim 10 wherein the taper
5 of said tapered fiber section from the input end thereof to the
6 output end thereof is at least 3:1.

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8 12. The combination according to Claim 11 further including
9 a collimating lens on the output end of said tapered fiber section.

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11 13. The combination according to Claim 5 wherein said tapered
12 fiber section has a uniform taper angle θ .

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14 14. The combination according to Claim 13 wherein said
15 tapered fiber section has a generally conical shape.

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17 15. The combination according to Claim 5 wherein said first
18 end of said tapered fiber section is physically coupled with the
19 output end of said first fiber section.

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21 16. The combination according to Claim 15 wherein said first
22 fiber section and said tapered fiber section comprise glass fibers.

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24 17. The combination according to Claim 16 wherein said
25 tapered fiber section has a generally conical shape.

1 18. The combination according to Claim 5 wherein said tapered
2 fiber section has a generally conical shape.

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4 19. The combination according to Claim 5 wherein said tapered
5 fiber section is integrally formed with said first fiber section on
6 the output end thereof.

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8 20. The combination according to Claim 5 further including a
9 collimating lens on the output end of said tapered fiber section.

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11 21. The combination according to Claim 5 wherein said first
12 fiber section and said tapered fiber section comprise glass fibers.

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14 22. An optical fiber assembly with Numerical Aperture (NA)
15 compression including in combination:

16 an illumination fiber section having a light input end
17 and a light output end and having a first predetermined diameter;

18 a first tapered fiber section of a predetermined length
19 with an input end of said first predetermined diameter optically
20 coupled with the output end of said first fiber section, and having
21 an output end of a second predetermined diameter greater than said
22 first predetermined diameter;

23 a collection fiber section having a light input end and
24 a light output end, said collection fiber section physically
25 located with the light input end thereof adjacent the light output
26 end of said tapered fiber section.

1 23. The combination according to Claim 22 wherein said output
2 end of said illumination fiber section is physically and optically
3 coupled with the input end of said first tapered section.

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5 24. The combination according to Claim 22 wherein said
6 collection fiber section is a second tapered fiber section, and the
7 light output end of said second tapered fiber section has a second
8 predetermined diameter, and the light input end of said second
9 tapered fiber section has a third predetermined diameter greater
10 than said second predetermined diameter.

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12 25. The combination according to Claim 24 wherein said
13 illumination fiber section, said first tapered fiber section and
14 said collection fiber section all comprise glass fiber material.

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16 26. The combination according to Claim 25 wherein said
17 collection fiber section comprises a plurality of substantially
18 identical collection fiber sections.

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20 27. The combination according to Claim 26 wherein said
21 plurality of collection fiber sections are physically arranged with
22 the light input ends thereof around said first tapered fiber
23 section.

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1 28. The combination according to Claim 27 wherein the output
2 of said first tapered fiber section and the input ends of said
3 collection fiber sections are fused to one another.

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5 29. The combination according to Claim 28 wherein said output
6 end of said illumination fiber section is physically and optically
7 coupled with the input end of said first tapered section.

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9 30. The combination according to Claim 22 wherein said
10 illumination fiber section, said first tapered fiber section and
11 said collection fiber section all comprise glass fiber material.

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13 31. The combination according to Claim 22 wherein said
14 collection fiber section comprises a plurality of substantially
15 identical collection fiber sections.

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17 32. The combination according to Claim 31 wherein said
18 plurality of collection fiber sections are physically arranged with
19 the light input ends thereof around said first tapered fiber
20 section.

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22 33. The combination according to Claim 32 wherein the output
23 of said first tapered fiber section and the input ends of said
24 collection fiber sections are fused to one another.

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1 34. The combination according to Claim 22 wherein said
2 plurality of collection fiber sections are physically arranged with
3 the light input ends thereof around said first tapered fiber
4 section.

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